

REMARKS

Claims 1-55 are pending in the application and have been rejected. Claims 1-55 have been rejected under 35 U.S.C. § 112, first paragraph, claims 1-3, 5, 10-13, 15, 19-24, 26, 30-31, 33, 44, 45, 47-49 and 51 have been rejected under 35 U.S.C. § 102(b), and claims 1, 7, 11, 17, 22, 28, 38 and 39 have been rejected under 35 U.S.C. § 103(a).

I. Rejections under 35 U.S.C. § 112, first paragraph

The Examiner has rejected claims 1-55 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and use the invention. In particular, the Examiner maintains that the makeup or composition of the thermally conductive liquid that flows through the duct work has not been disclosed in either the specification or the claims.

Applicant respectfully disagrees with the Examiner's assertion. For example, in claim 1, the actual makeup of the liquid medium is not essential to the structure. Rather, as recited in the claim, it is important that the structure is adapted to allow a liquid medium to flow therethrough. In other words, the type of liquid used is not critical, so long as the duct is adapted for liquid flow.

Claim 2 narrows claim 1 by reciting that the liquid medium is thermally conductive. On page 6, lines 20-21, the specification discloses that any type of thermally conductive liquid can be used as long as it does not deteriorate the tube or blanket walls. Also, on page 8, lines 10-15, the specification discloses that the liquid used should be able to rapidly absorb or transfer heat from the cells and should not break down or lose its thermal managing characteristics at extreme

temperatures. Applicant submits that one skilled in the art is knowledgeable of thermally conductive liquids, as well as their properties. Therefore, Applicant submits that the subject matter of claims 1-55 is described in the specification in such a way as to enable one skilled in the art to make and use the invention. Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection.

The Examiner has also rejected claims 11-55 under 35 U.S.C. § 112, first paragraph, as being based on a disclosure which is not enabling. Specifically, the Examiner maintains that it is critical or essential to the practice of the invention for the duct work to touch each and every one of the cells. The Examiner cites page 4, lines 9-16 of the specification, which sets forth that tube 13 makes contact with each of the battery cells as it winds through a battery casing. The Examiner contends that the invention would not work as claimed unless the tube makes contact with each of the cells. Therefore, the Examiner asserts that a similar requirement must be recited in claims 11-55.

However, contrary to the Examiner's assertion, it is not critical or essential to the practice of the invention that the duct work touch each and every one of the cells. Rather, on page 4, lines 20-22, the specification states that it is desirable (not critical) to have as much of the cell surfaces covered by the tube or blanket to provide as large a thermally conductive surface as reasonably possible. Therefore, Applicant believes the Examiner has misinterpreted the cited portion of the specification and respectfully requests the Examiner to withdraw the rejection.

II. Drawing Objections

The Examiner has objected to the drawings under 37 C.F.R. § 1.83(a) for not showing every feature of the invention specified in the claims. Specifically, the Examiner asserts that the rectangular cross-section tubing must be shown or the feature canceled from the claims. Accordingly, Applicant has added Figure 11 to show the feature and respectfully requests the Examiner to acknowledge receipt of the drawing.

III. Rejections under 35 U.S.C. § 102(b)

A. The Examiner has rejected claims 1-3, 5, 10-13, 15, 19, 21-24, 26, 30, 33, 44, 47-49 and 51 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,567,119 to Lim ("Lim"). In particular, the Examiner maintains that the figures of Lim, along with col. 3, line 60 through col. 4, line 36, teach or disclose the features of the above claims.

1. Claim 1

Applicant submits that claim 1 is patentable over the cited reference. For example, claim 1 recites that a duct, defining a single flow path, contacts an outer wall of each of the plurality of cells in a serial manner. Further, the duct is adapted to allow a liquid medium to flow therethrough.

The Examiner maintains that Lim discloses the above features. However, Applicant submits that the Examiner is misinterpreting and/or misapplying the cited reference. For example, as shown in Figure 1 of Lim, battery 10 has an assembly stack 27 which is comprised of a plurality of unit cell assemblies stacked on top of each other (col. 4, lines 1-6). Cooling

plates 32, 34 are located on top and underneath each cell assembly (Fig. 1; col. 4, lines 13-19). Coolant tubes 26, 28 supply coolant fluid to each coolant plate 32, 34, as shown in Figure 1 (col. 4, lines 18-19). However, contrary to claim 1, coolant tubes 26, 28 and coolant plates 32, 34 fail to define a single flow path which contacts the cell assemblies in a serial manner (in series). Rather, as shown in Figure 1 of Lim, the coolant tubes 26, 28 feed coolant to multiple coolant plates, thus forming multiple flow paths. In addition, coolant plates 32, 34 of Lim contact outer walls of the cell assemblies in a parallel manner, rather than in a serial manner, as required by claim 1. Therefore, Lim fails to teach or disclose each and every limitation recited in claim 1.

Accordingly, Applicant submits that claim 1 is patentable over the cited reference and respectfully requests the Examiner to withdraw the rejection.

Since claims 2, 3, 5 and 10 are dependent upon claim 1, Applicant submits that such claims are patentable at least by virtue of their dependency.

3. Claim 11

Since claim 11 contains features that are analogous to the features recited in claim 1, Applicant submits that claim 11 is patentable for at least similar reasons as presented above.

In addition, since claims 12, 13, 15, 19 and 21 are dependent upon claim 11, Applicant submits that such claims are patentable at least by virtue of their dependency.

5. Claim 22

Since Applicant has amended claim 22 to incorporate the subject matter of claim 25, Applicant submits that claim 22 is patentable over the cited reference. For example, Lim fails to teach or disclose a thermally conductive medium positioned between at least one of the plurality

of thermal jackets (coolant plates 32, 34) and the cells, where the thermal jacket (coolant plates 32, 34) contacts the cell. As shown in Figure 1 of Lim, each coolant plate 32, 34 contacts each cell assembly directly. There is no disclosure that a thermally conductive medium is positioned in between.

Accordingly, Applicant submits that claim 22 is patentable over the cited reference and respectfully requests the Examiner to withdraw the rejection.

Since claims 23, 24, 26, 30, 33 and 44 are dependent upon claim 22, Applicant submits that such claims are patentable at least by virtue of their dependency.

In addition, due to the amendment of claim 22, Applicant has re-written claims 27, 31, 32, 34 and 46 into independent form, since such claims recite features that are neither taught nor disclosed in Lim.

7. Claim 47

Since claim 47 contains features that are analogous to the features recited in claim 1, Applicant submits that claim 47 is patentable for at least similar reasons as presented above under claim 1.

In addition, since claims 48, 49 and 51 are dependent upon claim 47, Applicant submits that such claims are patentable at least by virtue of their dependency.

B. The Examiner has also rejected claims 11-13, 15, 19-24, 26, 30-31, 33, 44 and 45 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 1,152,247 to Walker

(“Walker”). In particular, the Examiner maintains that the figures, and pages 1 and 2 of Walker, teach or disclose the features of the above claims.

1. Claim 11

Applicant submits that claim 11 is patentable over Walker. For example, claim 11 recites a thermal management system for a battery including a plurality of cells comprising at least one thermal jacket for receiving a liquid thermal medium. Further, the thermal jacket defines a single flow path, and is located between and contacts adjacent one of said cells in a serial manner.

The Examiner maintains that such features are disclosed in Walker. However, Applicant believes the Examiner is misinterpreting and/or misapplying the cited reference. For example, Walker discloses a battery tank 10 comprising an inner jar 12 made of an insulating material and an outer jar 13 composed of metal (Fig. 1; page 2, left column, lines 13-26). Metal jar 13 has numerous channels 15 and ribs 14, which provide air passages to allow for air ventilation in between jars (Fig. 1; page 2, left column, lines 36-48). The circulation of air moves heat away from the cells (page 2, left column, lines 57-65). Such ventilation passages are not formed to regularly receive any type of liquid for thermal management, let alone a liquid “thermal” medium, as required by claim 11. In addition, as shown in Figure 1 of Walker, even if a thermal liquid was introduced into the numerous channels 15 and ribs 14, multiple flow paths would be created, rather than a single flow path, as required by claim 11. Therefore, Walker fails to teach or suggest every limitation of claim 11.

Accordingly, Applicant submits that such claim is patentable over the cited reference and respectfully requests the Examiner to withdraw the rejection.

Since claims 12, 13, 15 and 19-21 are dependent upon claim 11, Applicant submits that such claims are patentable at least by virtue of their dependency.

2. Claim 22

Turning to claim 22, the Examiner maintains that the figures, and pages 1 and 2 of Walker, teach or disclose the features of the claim. However, since Walker fails to teach or suggest a thermally conductive medium positioned between at least one of the plurality of thermal jackets (channels 15 and ribs 14) and the cells, where the thermal jacket (channels 15 and ribs 14) contacts the cell, Applicant submits that such claim is patentable. For example, as shown in Figure 1 of Walker, each channel 15 and rib 14 contacts each cell directly. There is no disclosure that a thermally conductive medium is positioned in between.

Since claims 23, 24, 26, 30, 33, 44 and 45 are dependent, either directly or indirectly, on claim 22, Applicant submits that such claims are patentable at least by virtue of their dependency.

IV. Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1, 7, 11, 17, 22, 28, 38 and 39 under 35 U.S.C. § 103(a) as being unpatentable over Lim. The Examiner acknowledges that Lim fails to suggest a pump for circulating coolant. However, in a conclusory manner, the Examiner maintains that it would have been obvious for one of ordinary skill in the art at the time of the invention to have

included a pump in the battery of Lim, so that fluid could be circulated through all of the batteries in a quicker manner, thus cooling the battery at a faster rate.

Applicant submits that this proffered motivation for modifying the prior art is conclusory and wholly unsupported by the prior art.

It is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988, emphasis added). Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. *In re Kotzab*, 55 USPQ2d at 1316-1317; *see also* MPEP § 2142 (*quoting Ex parte Clapp*, 227 USPQ 972, 973 (B. Pat. App. & Inter. 1985)) (“To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.”).

Here, the motivation proffered by the Examiner for modifying Lim to arrive at the claimed invention is simply not convincing. Lim does not even remotely suggest the use of a pump in its design. In addition, there is no suggestion in Lim that there is a need to “cool the battery at a faster rate” or “insure a longer life for the batteries,” as maintained by the Examiner. Therefore, Applicant submits that it would not have been obvious for one of ordinary skill in the art to include a pump in the battery of Lim.

Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection.

Amendment under 37 C.F.R. § 1.111
U.S. Application No. 09/862,591

V. Newly Added Claims

Applicant has added claims 56 and 57 to provide more varied protection for the present invention.

VI. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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PATENT TRADEMARK OFFICE

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The specification is amended as follows:

Page 4, the first full paragraph is amended as follows:

Figure 9 is a diagrammatical representation of a single cell in the electrochemical battery of any of Figures 1-5 shown with a thermal jacket and a thermal medium; [and]

Page 4, the second full paragraph is amended as follows:

Figure 10 is a diagrammatical representation of a metallic single cell in the electrochemical battery of any of Figures 1-5 shown with a thermal jacket of the present invention, a thermal medium, and a shrink-sleeve on the cell[.]; and

Page 4, the following paragraph is added after the second full paragraph:

Figure 11 is a cross-sectional view of the thermal management blanket shown in Figure

1.

The last paragraph beginning on page 5 and ending on page 6 is amended as follows:

The cross-sectional shape of the tube or blanket 13 can be any shape conducive to allowing proper thermal management of the individual cells 12 in the battery 10. In a standard electrochemical battery the preferred cross-section of the tube 13 would be rectangular (as shown

in Fig. 11). This will allow maximum surface contact between both the cells 12 and the blanket 13. However, the shape can be changed depending on the configuration and shape of the cells and battery, and may be optimized for each different battery configuration. Moreover, depending on the cell and battery configuration, the cross-section shape or size can change in the tube or blanket 13 used in the battery. This would allow for manufacture optimization. However, if the shape of the cross-section of a single tube is to change along its length, the change should not be significant so as to adversely affect the proper flow of the liquid within the tube.

The last paragraph beginning on page 6 and ending on page 7 is amended as follows:

Each of the intake and exit manifolds 14, 15 allows for flow of the thermally managing liquid through the tube 13. The manifolds 14, 15 are connected to a fluid flow manifold or device such as a pump (not shown) which would be used to provide the flow of the liquid through the tube. Any type of thermally conductive liquid can be used, however, it is important to ensure that the liquid used would not deteriorate the tube or blanket walls. Any commonly known or used flow manifold, flowing device, or pump can be used to provide the fluid flow through the tube. In the preferred embodiment, the fluid flow device will provide enough flow to ensure that a slight internal pressure is maintained with the tube to aid in maintain the flow of the liquid while at the same time preventing the walls of the tube or blanket 13 from collapsing. This is particularly true when the walls of the tube are made thin. Tube collapse could also be prevented by using additional structural support within the tube, such as ribs [(not shown)]18, or

providing additional tube wall reinforcement (not shown). If internal ribs 18 are used they should be configured such that they do not adversely interfere with the liquid flow to ensure optimal thermal management.

IN THE CLAIMS:

Claim 25 has been canceled without prejudice or disclaimer.

The claims are amended as follows:

1. (Once Amended) A thermal management system for a battery including a plurality of cells, comprising:

at least one duct defining a single flow path and contacting an outer wall of each of said cells in a serial manner adapted to allow a liquid medium to flow therethrough.

11. (Once Amended) A thermal management system for a battery including a plurality of cells, comprising:

at least one thermal jacket for receiving a liquid thermal medium;

wherein said at least one thermal jacket defines a single flow path, and is located between and contacts adjacent one of said cells in a serial manner.

27. (Once Amended) A thermal management system [according to claim 22, further comprising]for a battery including a plurality of cells, comprising:

a plurality of thermal jackets for receiving a liquid thermal medium;

wherein each of said plurality of thermal jackets is located between adjacent ones of said cells, and

a heating and cooling apparatus to heat or cool said liquid.

31. (Once Amended) A thermal management system [according to claim 22,] for a battery including a plurality of cells, comprising:

a plurality of thermal jackets for receiving a liquid thermal medium;

wherein each of said plurality of thermal jackets is located between adjacent ones of said cells, and

wherein at least one of said plurality of thermal jackets has a rectangular cross-section.

32. (Once Amended) A thermal management system [according to claim 22,] for a battery including a plurality of cells, comprising:

a plurality of thermal jackets for receiving a liquid thermal medium;

wherein each of said plurality of thermal jackets is located between adjacent ones of said cells, and

wherein at least one of said plurality of thermal jackets has a changing cross-section throughout the length of said at least one thermal jacket.

34. (Once Amended) A thermal management system [according to claim 22, further comprising] for a battery including a plurality of cells, comprising:

a plurality of thermal jackets for receiving a liquid thermal medium;
wherein each of said plurality of thermal jackets is located between adjacent ones of said
cells, and

a heating and cooling apparatus to which each of said plurality of said thermal jackets is connected.

46. (Once Amended) A thermal management system [according to claim 22,] for a
battery including a plurality of cells, comprising:

a plurality of thermal jackets for receiving a liquid thermal medium;
wherein each of said plurality of thermal jackets is located between adjacent ones of said
cells, and

wherein each of said plurality of thermal jackets has a changing cross-section throughout the length of said thermal jackets.

47. (Once Amended) A method of thermally managing the temperature of a battery including a plurality of cells by thermally managing the temperature of said cells, comprising:
passing at least one hollow tube, defining a single flow path, among at least some of said cells so as to make contact with said at least some of said cells in a serial manner; and
passing a liquid medium through said at least one hollow tube.

Claims 56 and 57 are added as new claims.